



Dimbach, Germany (1.4 MW); Blitzstrom / Beck Energy

The New Frontier: The Emerging Renewable Energy Landscape

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● Renewable Energy Drivers

- Climate Change
- Air Quality
- Fuel diversity
- National Security
- Economic Stimulus
- Green Jobs





● Renewable Energy "Gold Rush"?

BLM Renewable Land Applications Overview

- Total Solar Applications : 223 (10 MW and larger)
- Total Wind Applications: 253
- California alone has 107 solar applications
- Solar applications comprise over 2.3 million acres
- 75 solar projects are listed on BLM website, 1/3 of all applications, total 51.6 GW
- Of the 223 applications, only 3 have progressed to stage of environmental review
 - the real "make or break", when it comes to issuing permits



● How do we get there?



Utility-Scale

- Ground Mounted Systems
 - Typically Multi-MW



Distributed Generation

- Roof Mounted Systems
 - 30kW to MW+





Development Challenges for Large-Scale Solar



● Development Challenges for Large-Scale Solar



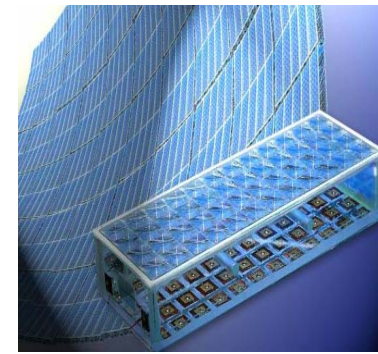
Stakeholder Perspective

- Land use requirements
- Impact on habitat / species
- Water use
- Carbon footprint
- Visual impacts
- Cost

Developer Perspective

- Available land
- Solar insolation
- Proximity to transmission lines & load centers
- Terrain / topography (e.g., appropriate slope)
- Multiple planning processes (federal, state, local)
- Cost / time to construct

● All Solar Technologies Are Not Created Equal



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● Land Use Requirements



Site:	Dimbach, Germany
System Size:	1.4MW
Project Developer:	Blitzstrom/Beck Energy



Site:	Colorado Springs, CO USA (Ft. Carson)
System Size:	2MW
Project Developer:	Conergy



Site:	Narbonne, France
System Size:	7 MW
Project Developer:	EDF Energies Nouvelles

● Land Use Requirements

El Dorado PV Power Plant

- Constructed next to existing natural gas plant
- Constructed in less than 5 months - 137 days
- 48 MW expansion to begin in 2009



Site:	Nevada, USA
System Size:	10 MW (AC)
Completed:	December 2008
System Purchaser:	Sempra Generation



● Impact on Habitat / Species

Site Development Options





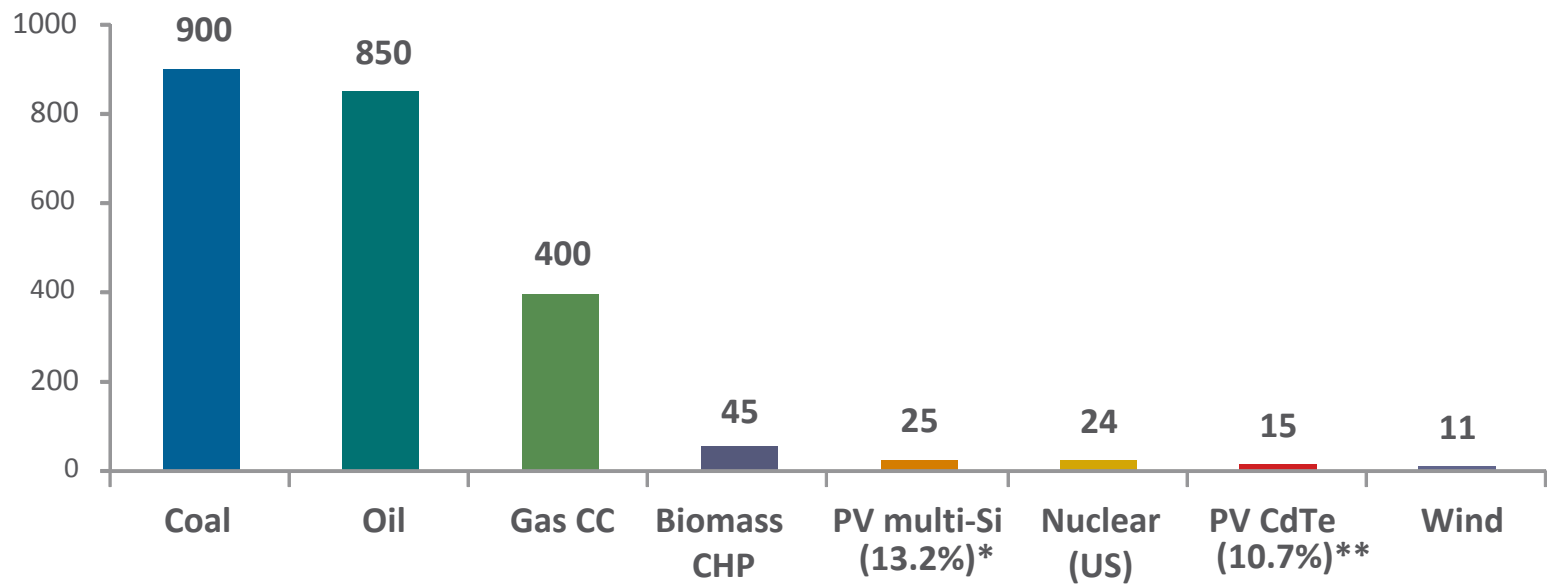
● Water Use



- Water Use Estimates for a 400 MW Solar Thermal facility provided to the CEC:
 - 75-150 Acre Feet per Year (AFY) for construction for a 400 MW facility
 - (translates to 104-207 AFY for a 550 MW facility)
 - 100 AFY during 25 year operation of such facility
 - (translates to 138 AFY for 550 MW facility)
- Estimates for First Solar's 550MW Solar PV facility include:
 - 20 AFY during construction
 - 2/10^{ths} of an AFY during 25 year operation of the PV Facility

● Carbon Footprint

Global Warming Potential



Sources: *de Wild-Scholten, M., presented at CrystalClear Final Event in Munich on May 26, 2009. **de Wild-Scholten, M., 'Solar as an environmental product: Thin-film modules – production processes and their environmental assessment,' presented at the Thin Film Industry Forum, Berlin, April, 2009. Both PV technologies use insolation of 1700 kWh/m². All other data from ExternE project, 2003; Kim and Dale, 2005; Fthenakis and Kim, 2006; Fthenakis and Alsema, 2006; Fthenakis and Kim, in press.

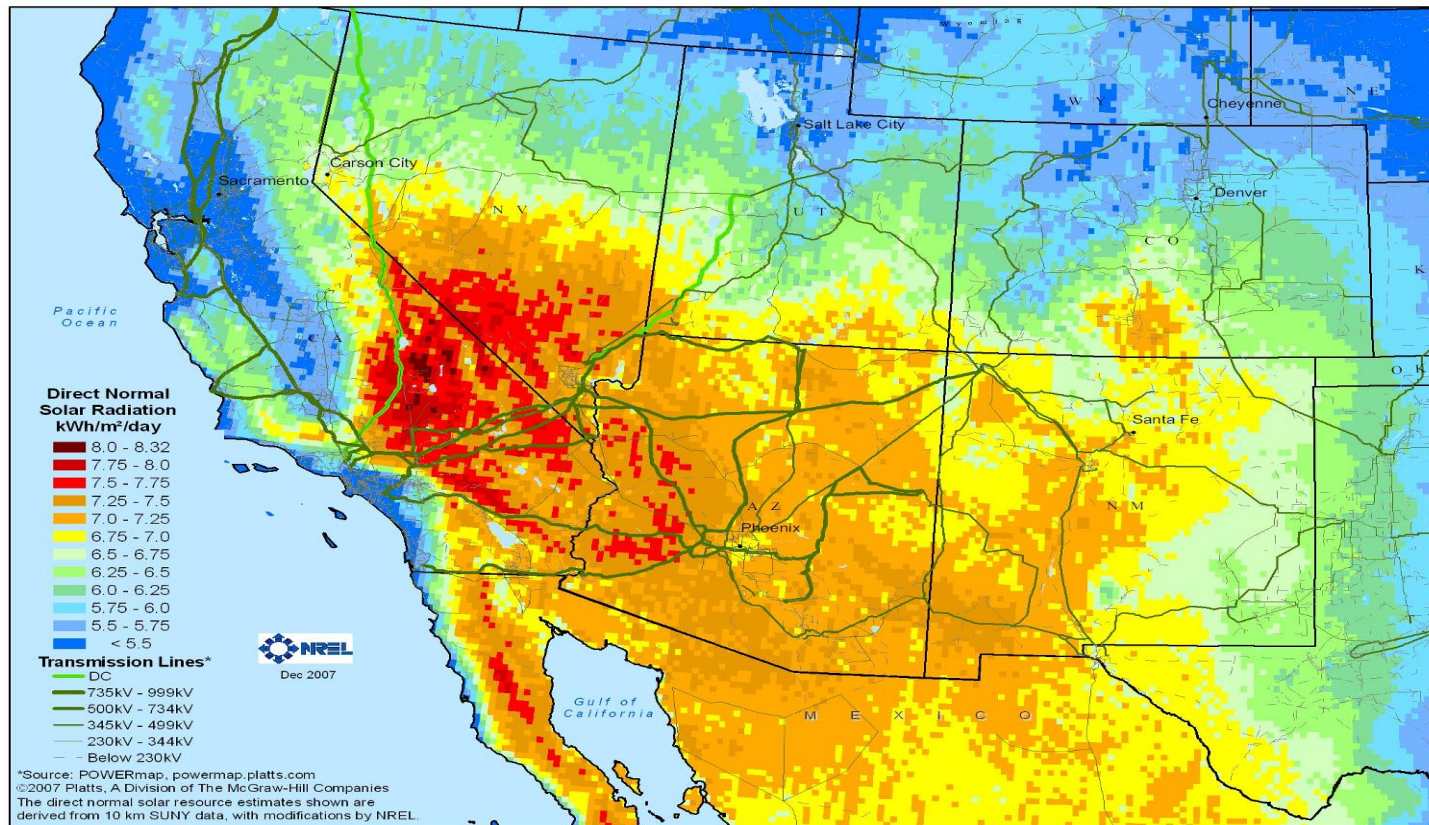
● Visual Impacts





Solar Resource (Southwest)

Solar Insolation with Transmission Overlay



First Solar Commercial Property

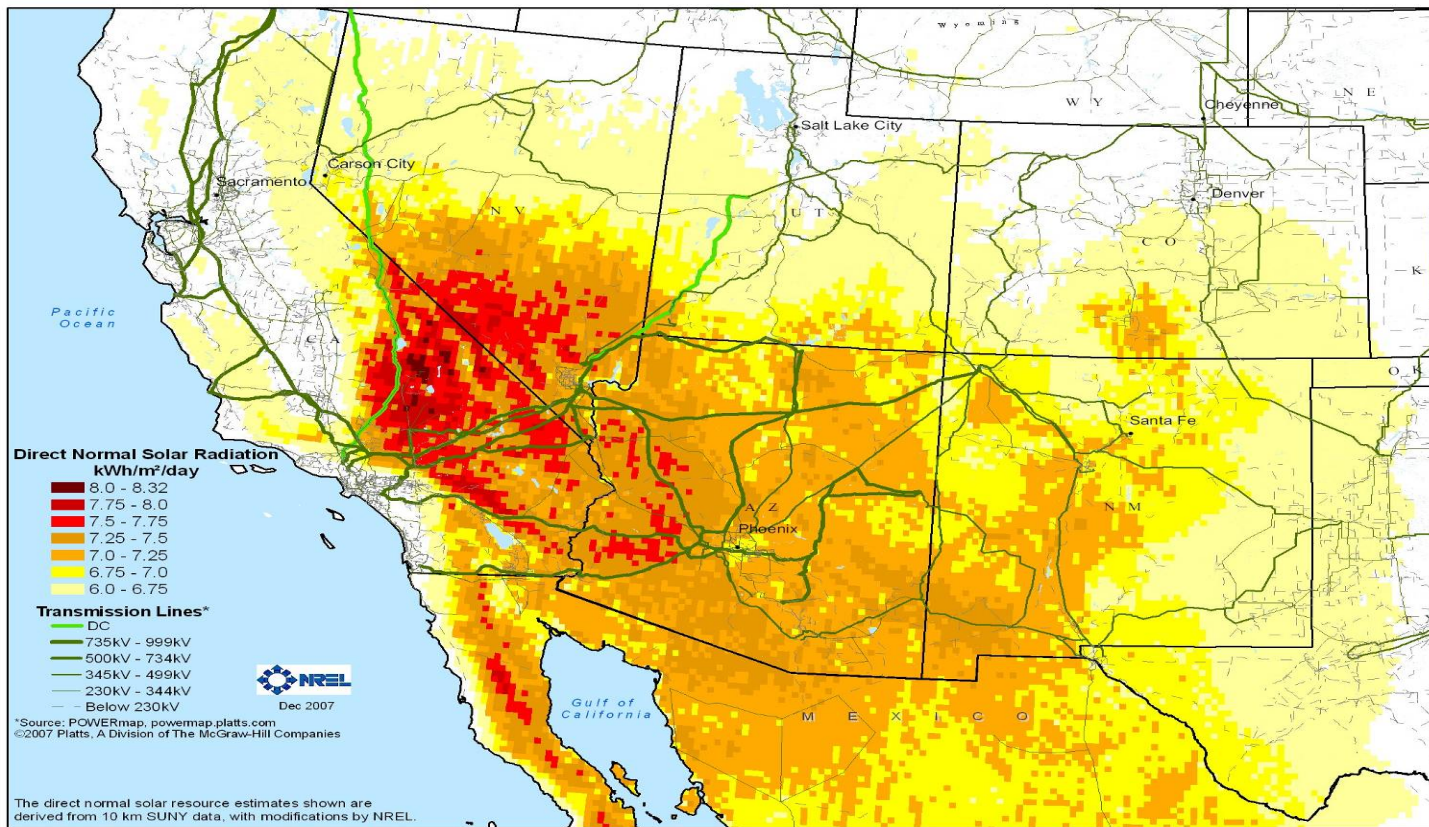
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14



Solar Resource (Southwest)

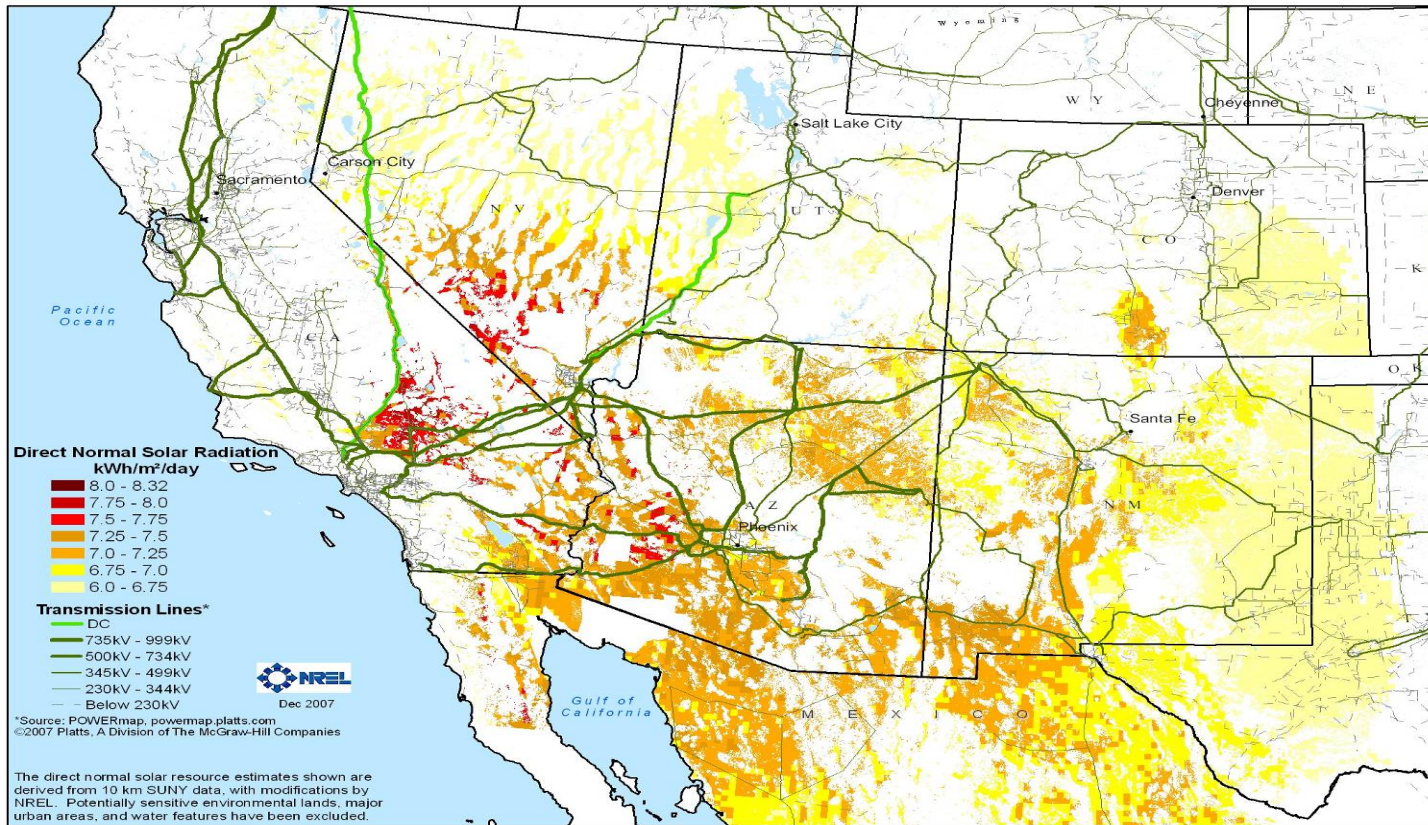
Solar Insolation > 6.0 kWh/m²/day





● Solar Resource (Southwest)

Previous Plus Environmental and Land Use Exclusions



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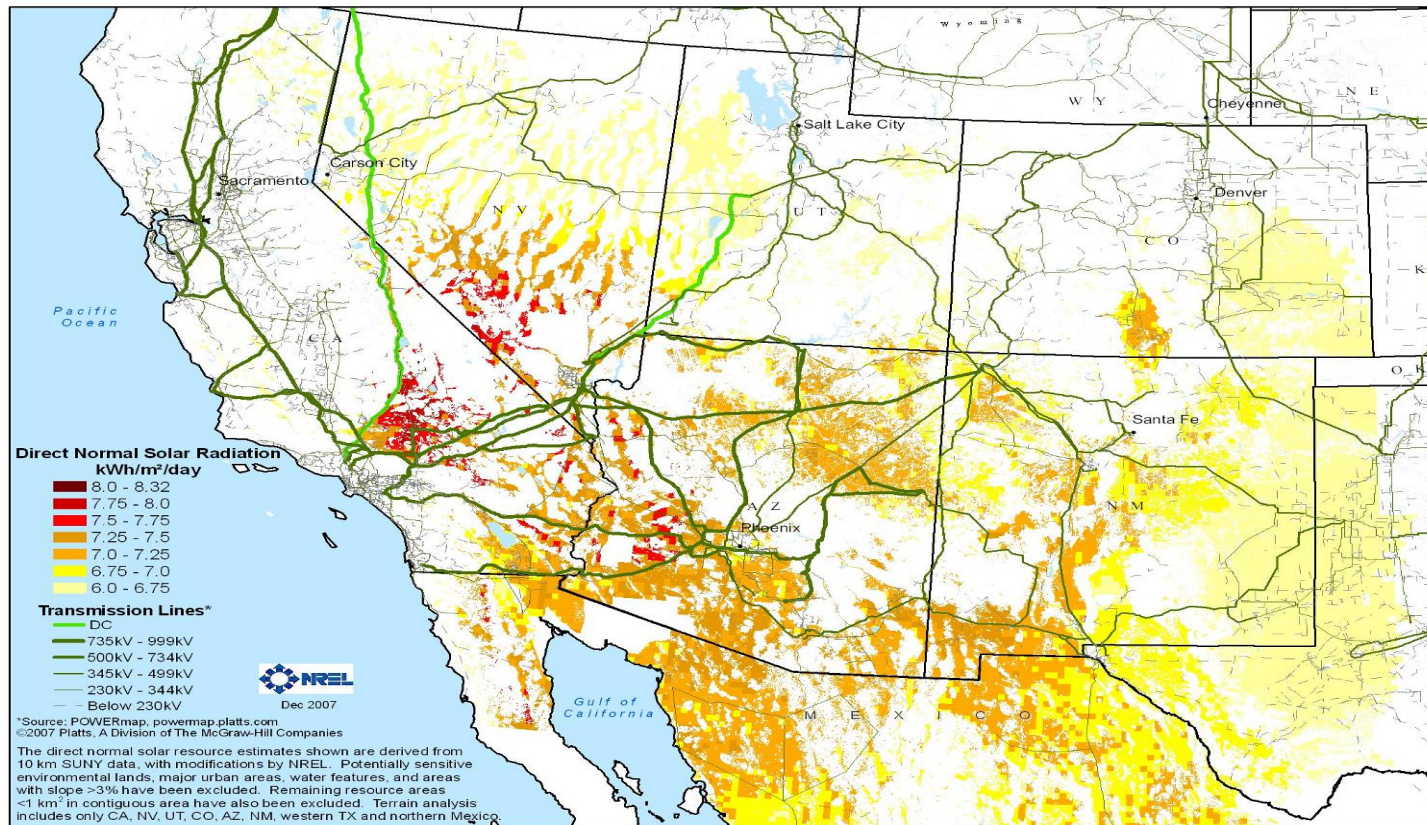
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16



● Solar Resource (Southwest)

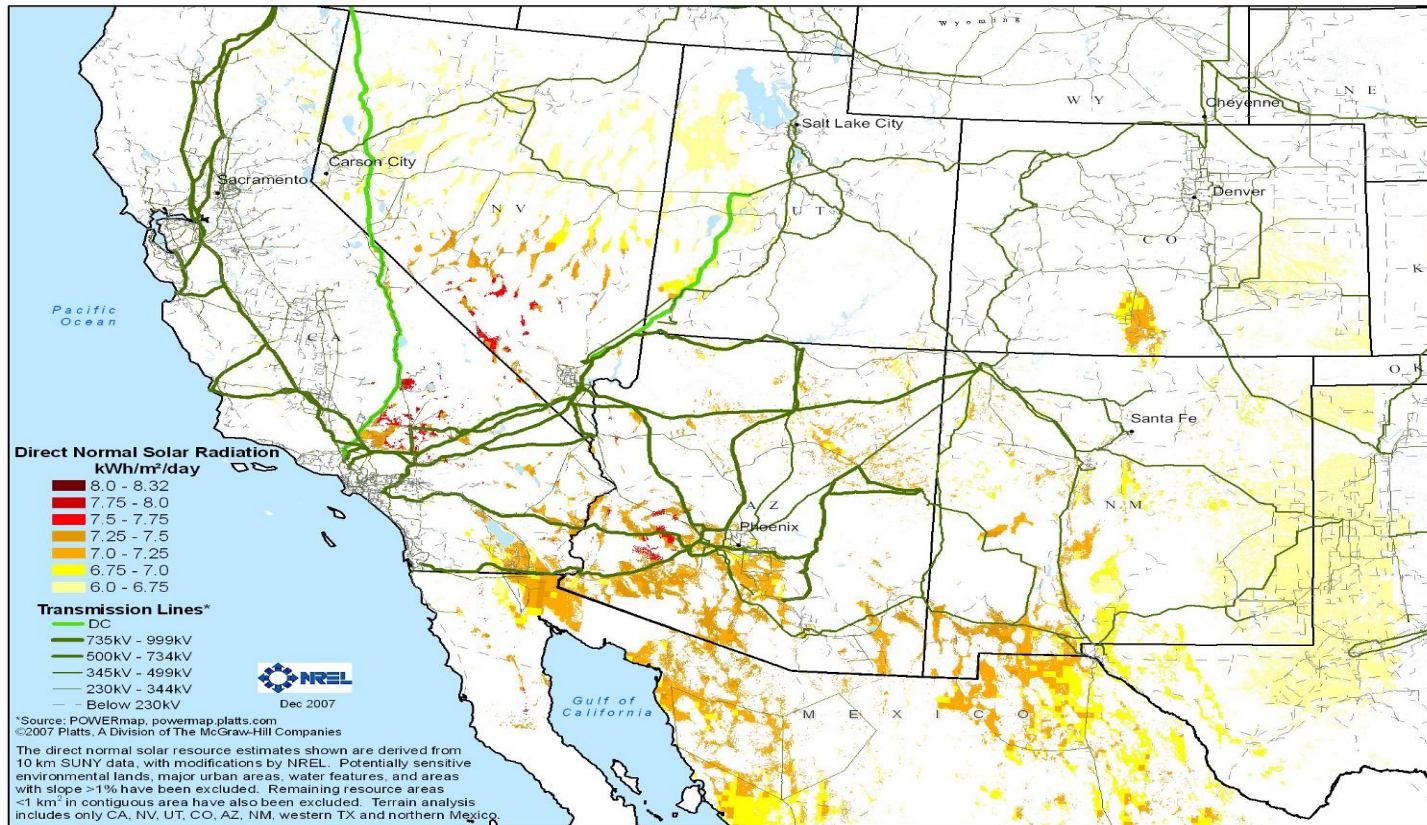
Previous Plus Slope <3%





● Solar Resource (Southwest)

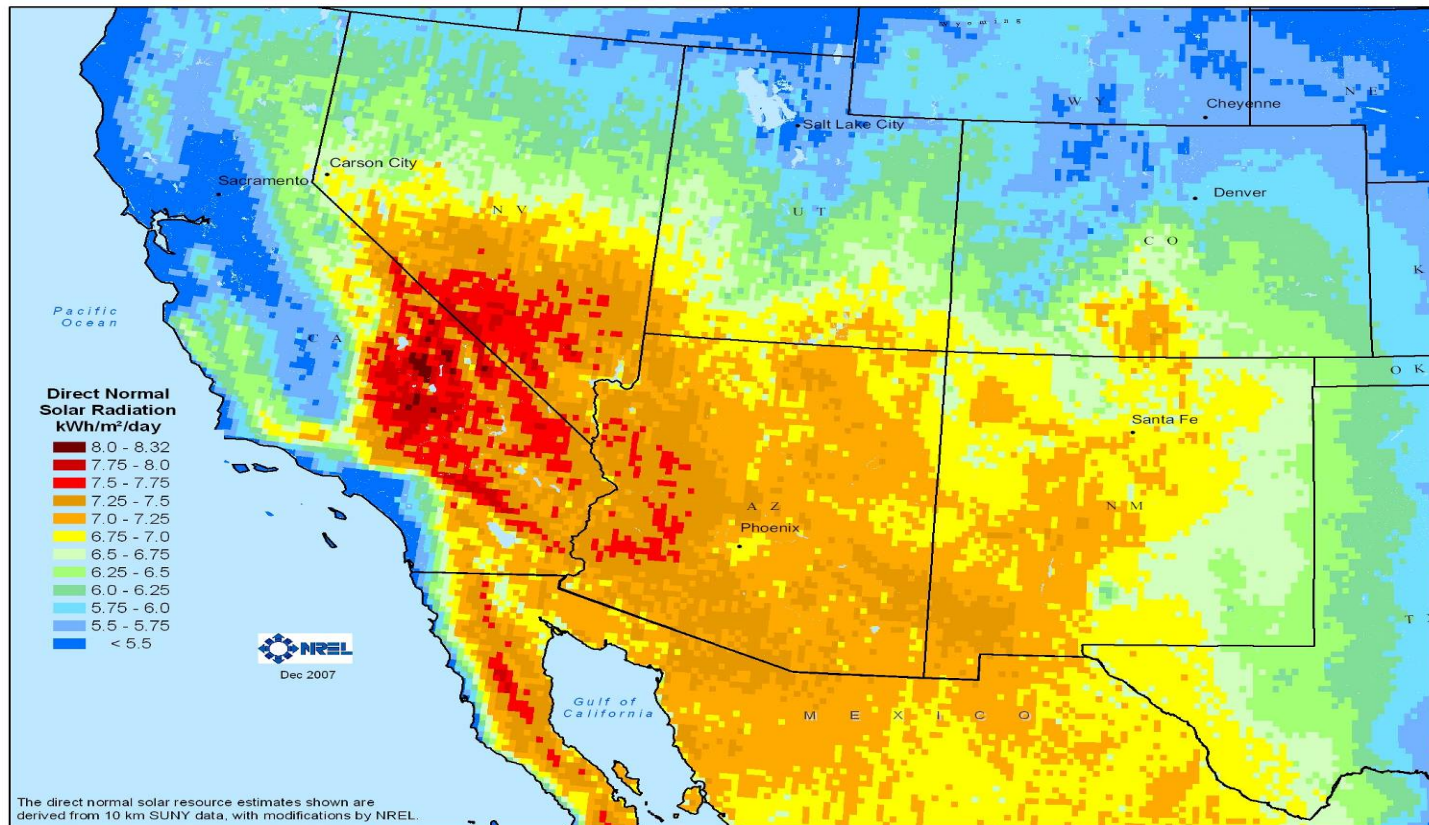
Previous Plus Slope <1%





Solar Resource (Southwest)

Solar Insolation “unfiltered”





● Multiple Efforts to Identify Appropriate Transmission Corridors and Renewable Energy Zones

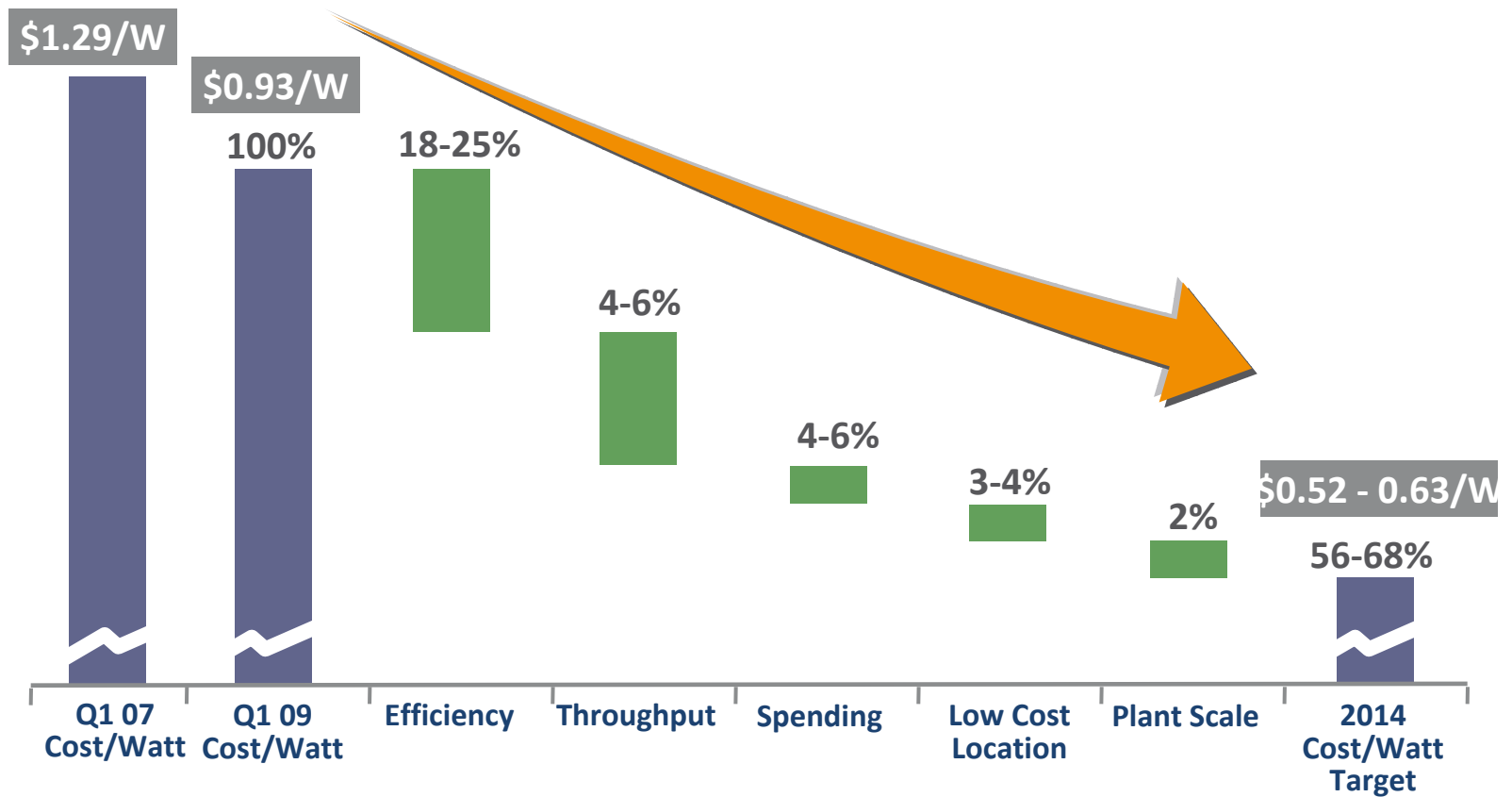


- Renewable Energy Transmission Initiative (RETI) -- CA
- Desert Renewable Energy Conservation Plan (DRECP) -- CA
- Western Renewable Energy Zones Initiative (WREZ) -- WGA
- Solar Programmatic Environmental Impact Statement (PEIS) -- BLM
- Other

● Cost Reduction Roadmap



Module Manufacturing (USD per watt)



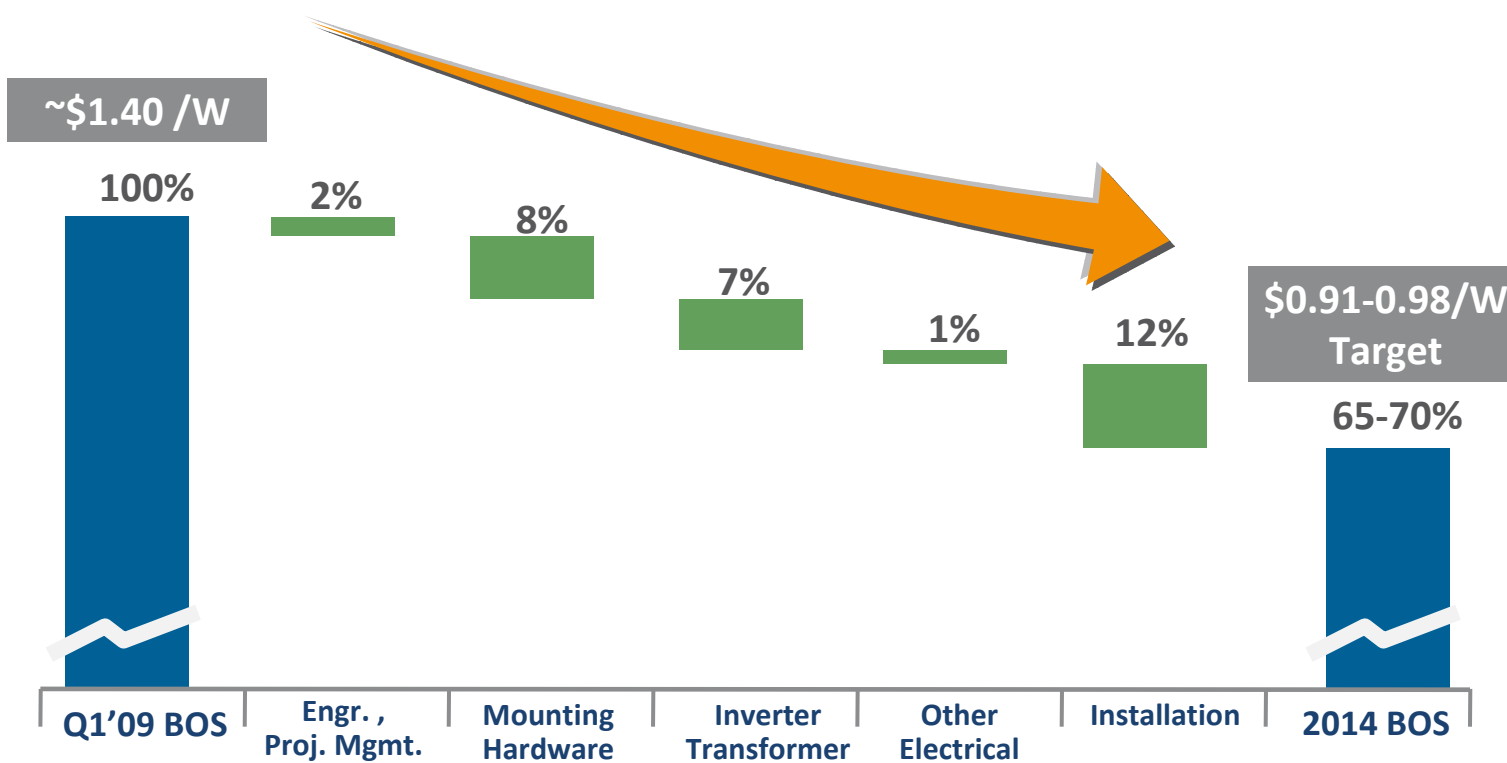
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21

● Cost Reduction Roadmap

Balance of System*



* Excludes Site Specific costs, BOS profits, sales tax, finance costs, SG&A costs and project development costs and assumes optimal labor costs

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Development Opportunities for Large-Scale Solar



● Developer Opportunities



- Avoid areas with high environmental sensitivity
- Prioritize use of previously disturbed non-prime agricultural land and/or where construction of solar plants would be an accepted land use
- Limit site disruption to the minimum required to safely and efficiently construct
- Enable potential compatibility with key wildlife species on-site
- Use of on-site and off-site mitigations to reduce wildlife impacts
- Limit water use in construction and operation
- Minimize visual obtrusiveness (e.g., low-profile technologies, buffer zones)



● Agency Opportunities



- Coordinate state, regional, and national transmission and renewable energy planning efforts
- Coordinate permit approvals (federal, state, local) to minimize duplicative efforts
- On federal lands, provide clear direction for wildlife impact mitigation plans
 - Use established Resource Management Plans where appropriate to avoid "run away mitigation"
- Allow flexibility in mitigation options
 - Expanded pool of land conservation organizations
 - In-lieu fees
 - Land banks
- Recognize that all technologies “are not created equal” and prioritize projects with multiple environmental benefits
- Staff field offices appropriately to deal with the renewable energy “gold rush”